qPSMA method for tumors. For the 1st cycle, VOIs were copied to the registered 48h SPECT and tissue-specific time-activity-curves were fitted to a mono-exponential function. For subsequent therapy cycles, a single-time-point approach utilizing tissue-specific effective half-lives from the 1st cycle was applied. Absorbed doses (ADs) were calculated using OLINDAv.2.2.0, IDACv.2.1, and an in-house voxelized dosimetry framework, 3DVoxDos. 3DVoxDos includes convolution of the 1st SPECT per cycle with a 177Lu soft-tissue dose-kernel and CT-based voxel-wise density-weighting to create 3D dose rate images. Nextly, the effective half-lives per VOI were used in combination with the dose rate image to yield 3D dose images. Additionally, organ ADs were obtained using the organ time-integrated activity (TIA) and mass-scaled S-values in OLINDA and IDAC. Tumor ADs were calculated with the sphere-models of OLINDA and IDAC, both followed by lesion-wise density-weighting. All methods were compared in terms of percentage difference (PD) and paired t-test of organ and tumor ADs. ***Results:*** Significant difference (i.e. $p<0.05$) was found for ADs of IDAC vs. OLINDA with PDs (mean±SD) of +7±4%, -5±3%, -18±6%, -9±4%, and -3±5% for total tumor burden (TTB), liver, spleen, salivary glands, and kidneys, respectively. The PDs for 3DVoxDos vs. OLINDA were +12±12%, -5±4%, -19±8%, -0±5%, and -1±6% for TTB, liver, spleen, salivary glands, and kidneys, with significant difference in ADs for all except for salivary glands. When comparing 3DVoxDos against IDAC, PDs were +5±12%, 0±2%, -2±8%, +9±8%, and +2±2% for TTB, liver, spleen, salivary glands, and kidneys, respectively with no statistically significant difference in ADs except for salivary glands and kidneys. ***Conclusion:*** Our results indicate differences between OLINDA and IDAC or 3DVoxDos, while IDAC and 3DVoxDos showed overall agreement. Discrepancies were largest for tumors and spleen. Further analysis is required to understand the source of these variations.

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### Generation of a benchmark dosimetry dataset- An IAEA study

***G. Kayal***[1,2], *N. Barbosa Parada*[3], *C. Calderón Marín*[4], *L. Ferrer*[5,6], *J. A. F. Negrín*[7,8], *D. Grosev*[9], *S. Gupta*[10], *N. R. Hidayati*[11], *R. Hobbs*[12], *T. C. G. Moalosi*[13], *G. Poli*[14], *P. Thakral*[15], *V. Tsapaki*[16], *S. Vauclin*[7], *A. Vergara-Gil*[1], *P. Knoll*[16], *M. Bardiès*[8,17];
[1]*CRCT, INSERM, Toulouse, FRANCE,* [2]*SCK CEN, Belgian Nuclear Research Centre, Mol, BELGIUM,* [3]*Instituto Nacional de Cancerología ESE, Bogota, COLOMBIA,* [4]*Instituto de Oncología y Radiobiología (INOR), Havana, CUBA,* [5]*ICO René Gauducheau, Medical Physics Department, Saint Herblain, FRANCE,* [6]*CRCINA, UMR 1232, INSERM, Nantes, FRANCE,* [7]*DOSIsoft SA, Cachan, FRANCE,* [8]*IRCM, UMR 1194 INSERM, Université de Montpellier and Institut Régional du Cancer de Montpellier (ICM), Montpellier, FRANCE,* [9]*Department of Nuclear Medicine and Radiation Protection, University Hospital Centre Zagreb, Zagreb, CROATIA,* [10]*Department of Nuclear Medicine and PET, Mahamana Pandit Madanmohan Malviya Cancer Centre and Homi Bhabha Cancer Center (a TMC unit), Haryana, INDIA,* [11]*Research Center and Technology for Radiation Safety and Metrology - National Research and Innovation Agency (BRIN), Jakarta, INDONESIA,* [12]*Department of Radiation Oncology and Radiation Molecular Sciences, Johns Hopkins Medical Institute, Baltimore, MD, UNITED STATES OF AMERICA,* [13]*Department of Medical Imaging and Clinical Oncology, Medical Physics, Nuclear Medicine Division, Faculty of Medicine and Health Science, Stellenbosch University, Tygerberg Hospital, Cape Town, SOUTH AFRICA,* [14]*ASST Papa Giovanni XXIII, Bergamo, ITALY,* [15]*Department of Nuclear Medicine, Fortis Memorial Research Institute, Gurugram, Haryana, INDIA,* [16]*Dosimetry and Medical Radiation Physics, International Atomic Energy Agency, Vienna, AUSTRIA,* [17]*Département de Médecine Nucléaire, Institut Régional du Cancer de Montpellier (ICM), Montpellier, FRANCE.*

***Aim/Introduction:*** With the development of clinical dosimetry solutions for molecular radiotherapy (including CE-marked or FDA-approved commercial software), it is critical to generate means for evaluating the precision and accuracy of the procedure. This work aimed at designing a benchmark dataset for use in clinical dosimetry, to help professionals assess their proficiency of the software. ***Materials and Methods:*** A dosimetric analysis was performed by eight participants using PLANET® Dose (DOSIsoft SA) on a patient administered with Lutathera®. A standard dosimetry protocol was defined - rigid registration; organ (liver, kidneys) and lesion segmentation on CT and SPECT with 40% thresholding respectively; convolution of activity distribution to obtain absorbed dose rates (ADR), followed by ADR time integration to obtain absorbed doses (AD).Initial results shown a high variability in dosimetric results. This led to the introduction of intermediary checkpoints to better identify the sources of variation. Several working sessions were organized between participants, including a one-week final "live" dosimetry session on the same site, to discriminate between processing errors and normal inter-operator fluctuations.The procedure ultimately contributed to increasing the operator proficiency in clinical dosimetry/ ***Results:*** At the end of the optimization process, AD in organs varied within 5%. For lesions, this variation rose to 25%, primarily a consequence of the choice of the fitting model. Organ and lesion volumes differed amongst participants by 9.4% and by 5% respectively, with the exception of the right kidney varying by 14% because of a rather small volume segmented by one participant. The variability in organ activity was less than 10% except for the right kidney (11.5%), and the lesion activities varied by less than 5%. Yet, the fluctuations in activity concentration (AC) and ADR for the right kidney decreased to 4%, an expected but comforting result, and for other organs and lesions remained below 5%, except for normal liver (12%). Nevertheless, the ADR/AC ratio remained consistent among participants (variations less than 5.7%). ***Conclusion:*** This work resulted in the generation of a 'benchmark dataset' consisting of reconstructed patient SPECT/CT data at five time points, an associated calibration factor, a standard workflow to follow in PLANET® Dose, associated step-by-step intermediary dosimetry results, with a range of "expected values" that are considered normal. This will enable professionals to train themselves on the software (here PLANET® Dose, but an equivalent procedure can be implemented for different software) and to improve their own mastery of the software.